PADCO/U.S.A.I.D. SOCIAL SECTOR RESTRUCTURING PROGRAM
PADCO International Inc., Frolovskaya 6/8 Corpus 1, Kyiv, Ukraine, 254070
Tel: 38 044 463 7615, 16, 17, 18, 19: FAX 38 044 463 7620
e-mail: rvaughan@padco.kiev.ua

PROJECTING BENEFITS FOR FUTURE RETIREES

Prepared by PADCO Social Sector Reform Project

Prepared For Deputy Finance Minister Matvychuk

Prepared by PADCO/USAID

October, 1998

1. SUMMARY

During the past few months, we have been working with the government to develop an actuarial model of the solidarity system. We started with a relatively simple model, and have made enhancements over time. However, the methods used to estimate the number of future retirees and the benefits payable to those retirees has been quite simplistic. Both PADCO and the government of Ukraine recognized that this process would need to be enhanced in the future

Consequently, we have create a separate model using standard actuarial methodology for projecting the benefits payable to future retirees. This report documents the methods and procedures which we used to create this model. As with the prior model, we started by creating a relatively simple model to illustrate the basic calculations and procedures needed. We believe it is easier for the government to review and understand the model if we start with a basic model and enhance it over time.

The remainder of this report documents the model's methodology:

- Calculate the number of future retirees by type for each year
- Estimate the initial pension benefits payable to each year's new retirees
- Project benefit payments to each year's new retirees in all subsequent years.

We look forward to your review and analysis of these suggested methods. After you have had a chance to thoroughly review the model and this documentation, we can meet to discuss your concerns, and requested enhancements.

1. ESTIMATE NUMBER OF NEW RETIREES

The first key task is to estimate how many new retirees there will be in each future year. The number of retirees must be broken down by type of retirement. And the model must have the flexibility to analyze the financial impact of changes which effect some types of retirements, but not others. The basic steps in estimating the number of new retirees is:

- Estimate the number of workers in each year
- Estimate the probability that a person will retire in that year. The probabilities must vary by type of retirement, age and sex
- Multiply the number of workers by the various probabilities to get the number of new retirees each year. (Note: For social pensions, the probabilities should be applied to the entire population, and not to just the working population).

Each of these steps is discussed in more detail.

ESTIMATE NUMBER OF WORKERS

This model uses similar procedures to the existing actuarial model to estimate the number of workers. The model starts with the population projections for each year. Population projections show the number of individuals in all of Ukraine by age and sex. The total number of workers is then multiplied by the labor force participation rates to get the maximum size of the labor force, assuming full employment. Even in the best of economic times, 100% of the population will not be working. The primary reasons for failure to work are:

- Too young
- Attending university
- Disabled or too ill to work
- Retired

Of course, others don't work because they are unable to find jobs. Consequently, the maximum number of workers must be reduced to reflect unemployment. Theoretically, unemployment should vary by age and sex. At the current time, we don't have statistics to create such an unemployment table, so we are assuming the rate is the same at all ages.

ESTIMATE PROBABILITY OF RETIRING

The next step is to create a table which shows the probability an individual will retire in a given year. The probability of retirement must vary by age, sex and type of retirement. For example, regular retirements will occur at age 55 or later for women and 60 or later for men. However, those who are eligible for privileged

retirement will likely retire 5 to 10 years earlier. The retirement rates, therefore, reflect both the number of workers who meet the conditions for privileged retirement, as well as the probability they will be eligible and choose to retire at a given age. These retirement rates were developed by:

- Analyzing the reductions in labor force participation rates at older ages
- Examining actual data from Volynsk oblast
- Mortality rates from Goskomstat
- Experience in other countries with similar systems.

CALCULATE THE NUMBER OF NEW RETIREES

The number of new retirees each year, for all but social pensions, is equal to the number of workers at each age multiplied by the retirement probabilities. Since social pensions are paid to those who cannot work or don't have sufficient work history, the number of new social pensioners is equal to the total population multiplied by the retirement probabilities. So if the retirement rate for regular female retirees at age 55 is 60%, and there are 100,000 females who are age 55, the number of new retirees of this type will be equal to 60,000 (100,000 multiplied by 60%). The same procedure is followed for all other types of retirement in each year.

3. ESTIMATE INITIAL BENEFITS FOR NEW RETIREES

This model uses replacement ratios to calculate benefits for each year's new retirees. The benefit for each type of retirement is equal to the product of the average wage for all workers and the replacement ratio. The replacement ratios in the first year of the projection period are based on actual average benefits for each category of retirees as of January 1, 1998, adjusted for the March 1, 1998 benefit increase. The average benefit for existing retirees is divided by the average wage to convert it into a replacement ratio. The data is taken from Report 94 as of January 1, 1998. Average March 1, 1998 pension benefit increases for each type of retirement is based on data from the City of Lutsk. This data can be found in the "Existing RE, Total" spreadsheet in the prior model.

For purposes of this model, the replacement ratios are assumed to remain constant throughout the analysis period. In actuality, different pension reform proposals would be modeled by modifying the replacement ratios to reflect the impact of the proposed change.

Each year, the replacement ratio for each type of retirement is multiplied by the average wage for that year to generate the benefit payable to each new retiree. While the replacement ratios are constant, benefits are assumed to increase because the average wage goes up each year. In this model and the previous one, the average wage increases for inflation and increases in real wages. Consequently, the initial benefit payable to each future year's retirees increases from the prior year.

4. PROJECTION OF BENEFITS FOR FUTURE RETIREES

Once the number of new retirees has been calculated, and the benefit payable to each new retiree has been determined, benefit payments in future years can be projected. The model analyzes each year's new retirees separately. There are separate spreadsheets for 1998 new retirees, 1999 new retirees, etc. For 1998 retirees, for example, total benefit payments in 1998 is equal to the number of new retirees of each type, multiplied by the average benefit for that type of retirement. Since retirements occur uniformly throughout the year, on average, only a half year of benefit payments will be made in the year of retirement. In future years, the benefits are reduced for expected deaths, and increased for assumed pension indexing.

The same process is then repeated for 1999 new retirees. The total benefit payments for those retiring in 1999 is based on the projected number of new retirees in 1999 by type, multiplied by the average benefit by type. Future benefits for those retiring in 1999 is reduced for expected deaths and increased for pension indexing.

At the end, the benefits payments are summed to give total benefit payments for that year. For example, total benefit payments in 2000 would be equal to the benefits paid to those who retired in the year 2000, plus benefit payments to those who retired in 1999 and were still receiving payments in 2000, plus benefit payments to those who retired in 1998 and were still receiving payments in 2000.

5. MODEL LIMITATIONS

Any model will have its limitations. A model must be sufficiently accurate to give useful information, but it also must not be so complex that it cannot be understood. An effective model will provide government policy makers and other interested parties with sufficient information to make informed decisions. Consequently, there is always a trade-off between simplicity and increased accuracy. With this in mind, we made several decisions when constructing this model:

- The economic statistics used in this model and the prior one are based on government forecasts prior to the current economic crisis. These statistics should be revised to reflect updated projections
- As in the previous actuarial model, the population projections are static. With a 10 year projection period, this is not a serious problem. However, when the model is extended to 75 years, the population projection module must become more complex
- The unemployment rate is the same for males and females and at all ages. This is clearly not correct. Unemployment rates in the former Soviet Union tend to be higher at younger and older ages. Additional data is needed to improve the accuracy of this assumption
- The number of new retirees at each age for each type of retirement is calculated by multiplying the number of workers at that age by the probability of retirement. Theses probabilities were estimated by looking at actual data from Volynsk oblast. We also made sure the retirement rates were consistent with the labor force participation rate assumption. At older ages, labor force participation rates decline sharply due to retirement. So it is important for these two assumptions to be consistent with each other
- The replacement ratios were calculated by dividing the average benefit for each type of retirement by current average wages. So benefits are expressed as a percentage of the nationwide average wage for all retirees. These replacement rates also model only the current pension law. A different set of ratios is needed to model the draft pension law. This is also a very simplistic approach, but one which can be used to model a wide variety of alternative design options. A more complex option would be to calculate benefits using the actual benefit formula in the pension law. This would require projections of years of employment and calculation of actual average earnings at retirement. It would also require a separate calculation for each type of retirement
- Pension indexing in this model is for inflation only. It does not yet reflect the provisions of the draft pension law
- This model projects only total benefit payments. It does not separate benefit payments into basic benefits, supplements and targeted assistance. This feature will be added in the future
- New retirements are assumed to occur uniformly throughout the year. Consequently, on average, only half a year of benefit payments are made in the year of retirement.

- No deaths are assumed to occur in the year of retirement. Mortality decrements begin in the following year.

As with the previous model, incremental improvements can be made to the model over time. It is instructive to first start with and understand a simple model, and then slowly make it more complex. Ultimately, this model should be incorporated into the previous one to create a single financial model which can be used for cash flow projections for the current pension system, and any proposed reforms.

APPENDIX – EXPLANATION OF EACH SPREADSHEET IN THE MODEL

F, Population and M, Population	Male and female population by age in each year of the projection period
F, LF Participation and M, LF Participation	Labor force participation rates for males and females in each year of the projection period
Unemploym	Unemployment rates for each year by age
F, Wk Pop and M, Wk Pop	Working population for males and females by age. This is calculated from the population, labor force participation and unemployment spreadsheets
Female Decr and Male Decr	These tables show the probability that someone will retire each year by type of retirement, separately for males and females
F New Re and M New Re	This is the number of new retirees each year by type of retirement. It is calculated using the population, working population, and probability spreadsheets
Repl Ratio	This is the benefits by type of retirement each year expressed as a percentage of average wage
Econ Stat	This spreadsheet contains the basic economic statistics used in the model. This data affects pension indexing, average wage, and other factors
1998 RE, F and 1998 RE, M, etc.	This shows the benefits payable to those who retire in a given year, in the year of retirement and thereafter
Summary	Adds together the benefits payable to those who retire in each future year
Mortality	Mortality rates used to compute the decrease in benefit payment to retirees following retirement
Population	Population tables by age and sex